

REMARKS

Claims 1-6, 8-29 and 31-44 are pending in the subject application.

Claims 1-6, 8-29 and 31-44 stand rejected.

The Office's Response to Applicant's Arguments

At paragraph 1 of the Action, the Office provided a cursory and incorrect summation of Applicant's arguments put forth in its amendment filed November 26, 2007, and then provided an unfounded conclusion that such arguments are not persuasive because Johnson (U.S. Patent No. 6,415,253) teaches:

A system that computes the average energy of the overall signals then compares it to the incoming signals and analyzes the relationship between the energies of which are composed of calculated SNR values and used to determine levels of SNR in the received signal and the average signals (column 8 lines 46-67).

See Office Action, page 2.

It appears that the Office completely ignored Applicant's amendment to the claims and the arguments in support thereof and provided an incorrect summary of the selected portion of Johnson.

For example and with reference to the portions cited by the Office, Johnson provides a clear disclosure of computing estimated noise energy as a function of an average energy, compares average energy to noise energy, and then updates noise energy as a function of the average energy. *Id.* at 8:46-65. Johnson produces an average value of 80 samples in a data frame ("Eavg"). Eavg, at this point is average energy over 80 samples (*i.e.*, time average) and has no relation to noise or any form of noise tracking.

Eavg is then multiplied by a constant selected as a function of the value of noise energy ("En"). For example, if En is less than Eavg then the constant C1 is set to C1a. Otherwise, C1 is set to C1b. *Id.* at 8:46-57. En may then be updated utilizing the algorithm $En = C1 * En + (1 - C1) * Eavg$. This calculation of noise energy clearly falls short of the claimed subject matter that generates a noise estimate by *tracking* ramping noise. Such *tracking* is accomplished by detecting voice activity in a channel as a function of conditional comparisons of received Signal-to-Noise Ratios and average Signal-to-Noise Ratio thresholds. The mere disclosure of Johnson's computing noise energy as a function of average energy provides no support for a conditional comparison of any value therein. Thus, the Office's interpretation of Johnson is improper and the rejection premised thereon unsupported.

Rather, Applicant's claimed subject matter acknowledges the deficiencies of the prior art, such as Johnson, in that such prior art methods of spectral subtraction and statistic noise suppression encounter difficulties when attempting to reduce the noise contamination in a ramping, severe or non-stationary acoustic noise environment. Such prior art methods assume that a signal is contaminated by a broadband additive noise, noise is locally stationary or slowly varying in short intervals of time (hence the determination of Eavg as 80 samples as disclosed in Johnson), the expected value of a noise estimate during an analysis is equal to the value of the noise estimate during a noise reduction process, and/or the phase of a noisy, pre-processed and noise reduced, post-processed signal remains the same. Johnson exemplifies this prior art approach (*See*

Johnson, 1:55-60), and the Office's citation to Johnson confirms Applicant's earlier (and ignored) arguments.

Rejections under 35 U.S.C. § 103(a)

1. Claims 1-10, 19, 22, 24-26 and 42-44

In paragraph 2 of the Action, Claims 1-10, 19, 22, 24-26 and 42-44 stand improperly rejected under 35 U.S.C. §103(a) as being unpatentable by Johnson in view of Adlersberg. Claim 7 was cancelled in response to the previous action. Applicant does not understand the rejection. For example, Claims 24-26 and 42-44 are ultimately dependent upon independent Claims 23 and 35, respectively. However, neither Claims 23 nor 35 are rejected or even addressed in this paragraph (Claims 23 and 35 are, however, improperly rejected in paragraph 3 of the Action). As the Office is surely aware, a dependent claim includes the elements of the respective independent and intervening claims. By definition then, the rejection of Claims 24-26 and 42-44 here is improper, and Applicant respectfully requests reconsideration and withdrawal of the rejection thereof. Further, for this reason at least, the instant Action is improper and should be withdrawn and/or reconsidered.

With regard to independent Claim 1, as discussed above, it appears that the Office misunderstood the clear teachings of the primary reference Johnson and has failed to establish a *prima facie* case for obviousness because the Office to satisfy its burden of showing that the prior art discloses or suggests all of the claimed elements of independent Claim 1, and, as such, failed to satisfy its burden of showing that there is a suggestion or

motivation to one of ordinary skill in the art to modify the primary reference as the Office proposes.

Claim 1 recites in part:

- (a) applying a windowed Fourier transformation to said signal frames;
- (b) approximating signal magnitudes of said signal frames;
- (c) computing Signal-to-Noise Ratio magnitudes of said signal frames;
- (d) detecting voice activity in said channel as a function of conditional comparisons of received Signal-to-Noise Ratios and average Signal-to-Noise Ratio thresholds;
- (e) detecting noise activity in said channel;
- (f) estimating gain in said signal frames;
- (g) applying an estimated noise history to said signal frames to compute a spectral gain function;
- (h) applying said spectral gain function to the components of said windowed Fourier transformation; and,
- (i) applying an inverse Fourier transform to said signal frames thereby reconstructing a noise reduced output signal frame.

Johnson teaches a noise suppression method and device that receives an input signal and generates a series of data frames. *See* Johnson 6:21-27. The frames are passed through a series of filters to remove the DC component (*Id.* at 6:33-44) and a window is applied to the filtered frames. An FFT is applied to the windowed signal to produce 321 sets of a magnitude component and a phase component of the received frequency spectrum. *Id.* at 7:10-14, 7:20-25. A Voice Activity Detector (VAD) receives the components and detects the presence of a speech component in a noise corrupted signal by measuring the energy and frequency content of a data frame of samples (80 samples) and flagging the content to define the state of the data frame of samples. *Id.* at 7:28-47.

As discussed above, Johnson then computes noise energy as a function of an average energy (*Id.* at 8:46-65) and calculates gain values based on smoothed frequency components and the state of the speech signal outputted from the VAD. *Id.* at 13:26-36. The noise energy is integrated with past values of noise energy to produce a spectrum of noise in the frame. *Id.* at 14:1-21. The smoothed gain values are applied to the raw magnitude components of the speech signal and the raw magnitude components are combined with the original phase components to produce a noise reduced FFT frame. This noise reduced FFT frame is then provided to an inverse FFT module to convert the FFT frame to a noise suppressed frame in the time domain. *Id.* at 15:21-32.

The Office admits that Johnson fails to teach applying an estimated noise history to signal frames to computer a spectral gain function. However, Johnson also fails to teach computing SNR magnitudes of the signal frames and detecting voice activity **as a function of conditional comparisons of received Signal-to-Noise Ratios and average Signal-to-Noise Ratio thresholds.**

Johnson provides a clear teaching of prior art spectral subtraction methods acknowledged by Applicant in its background by utilizing a time average (that is, a computation of noise energy as a function of an average energy) rather than providing a tracking of ramping noise. Further, the spectral subtraction method of Johnson fails to teach or describe utilizing SNR to determine gain for a frequency component of a signal. The gain values computed in Johnson are clearly based on smoothed frequency components and the state output of the VAD. Thus, there is no need in Johnson for SNR and the Office's reliance upon Johnson in this instance is also misplaced. Johnson's

silence as to these claimed elements cannot properly provide *prima facie* support for a rejection thereof under 35 U.S.C. § 103(a), and the Applicant hereby respectfully requests that the Office reconsider and withdraw the rejection of independent Claim 1.

Claims 2-6, 8-10, 19 and 22 are dependent upon independent Claim 1. "If an independent claim is non-obvious under 35 U.S.C. § 103, then any claim depending therefrom is non-obvious." *See* MPEP 2143.03. Therefore, without addressing the additional patentable elements thereof, Applicant respectfully requests that the Office withdraw the § 103 rejection of Claims 2-6, 8-10, 19, 22. As discussed above, Claims 24-26 and 42-44 are dependent upon independent Claims 23 and 35, respectively. The rejection thereof, by definition, is improper, and Applicant respectfully requests reconsideration and withdrawal of the rejection thereof without addressing the additional patentable elements contained therein.

2. Claims 20, 21, 23, and 34-42

In paragraph 3, spanning pages 9-17, of the Action, Claims 20, 21, 23 and 34-42 stand improperly rejected under 35 U.S.C. §103(a) as being unpatentable by Johnson in view of Adlersberg and Sluijter.

Addressing the rejection, independent Claims 23 and 35 each include the element of "identifying speech segments from said noise component as a function of conditional comparisons of received Signal-to-Noise Ratios and average Signal-to-Noise Ratio thresholds." Incorporating the discussion above, neither the primary reference Johnson nor the art of record teaches, suggests or discloses this element. Reconsideration and withdrawal of the rejection of independent Claims 23 and 35 are respectfully requested.

Claims 20-21, Claim 34 and Claims 36-42 are dependent upon independent Claims 1, 28 and 35, respectively. Claims 1, 28 and 35 are in condition for allowance. By virtue of dependency alone and without addressing the additional patentable elements thereof, Applicant respectfully requests that the Office reconsider and withdraw the rejection of Claims 20-21, 34 and 36-42.

3. Claim 27

In paragraph 4 of the Action, Claim 27 stands improperly rejected under 35 U.S.C. §103(a) as being unpatentable by Johnson in view of Adlersberg and Hermansky. Claim 27 is dependent upon independent Claim 23. Claim 23 is in condition for allowance. By virtue of dependency alone and without addressing the additional patentable elements thereof, Applicant respectfully requests that the Office reconsider and withdraw the § 103 rejection of Claim 27.

4. Claims 11-15, 18 and 28-32

In paragraph 5 of the Action, Claims 11-15, 18 and 28-32 stand improperly rejected under 35 U.S.C. §103(a) as being unpatentable by Johnson in view of Adlersberg, Bizjak and Hermansky. Claims 11-15 and 18 are dependent upon independent Claim 1. Claim 1 is in condition for allowance. By virtue of dependency alone and without addressing the additional patentable elements thereof, Applicant respectfully requests that the Office reconsider and withdraw the § 103 rejection of Claims 11-15.

Independent Claim 28 includes the element of “a voice activity detector...said voice activity detector detects and attacks noise activity on a frequency channel as a

function of conditional comparisons of received Signal-to-Noise Ratios and average Signal-to-Noise Ratio thresholds.” Incorporating the discussion above, neither the primary reference Johnson nor the art of record teaches, suggests or discloses this element. Reconsideration and withdrawal of the rejection of independent Claim 28 is respectfully requested.

Claims 29 and 31-32 are dependent upon independent Claim 28. Claim 30 has been cancelled without prejudice. Claim 28 is in condition for allowance. By virtue of dependency alone and without addressing the additional patentable elements thereof, Applicant respectfully requests that the Office reconsider and withdraw the § 103 rejection of Claims 29 and 31-32.

5. Claims 16-17

In paragraph 6 of the Action, Claims 16 and 17 stand improperly rejected under 35 U.S.C. §103(a) as being unpatentable by Johnson in view of Adlersberg, Sluijter, Bizjak and Hermansky. Claims 16 and 17 are dependent upon independent Claim 1. Claim 1 is in condition for allowance. By virtue of dependency alone and without addressing the additional patentable elements thereof, Applicant respectfully requests that the Office reconsider and withdraw the § 103 rejection of Claims 16 and 17.

6. Claim 33

In paragraph 7 of the Action, Claim 33 stands improperly rejected under 35 U.S.C. §103(a) as being unpatentable by Johnson in view of Adlersberg, Bizjak and Hermansky. Claim 33 is dependent upon independent Claim 28. Claim 28 is in condition for allowance. By virtue of dependency alone and without addressing the additional

patentable elements thereof, Applicant respectfully requests that the Office reconsider and withdraw the § 103 rejection of Claim 33.

Conclusion

Applicant submits that the present application is in condition for allowance.

Allowance of Claims 1-6, 8-29 and 31-44 is hereby requested.

If the Examiner believes that an in-person or telephonic interview with the Applicant's representatives will expedite the prosecution of the subject patent application, the Examiner is invited to contact the undersigned agents of record.

Should any additional fees be necessary in connection with the filing of this paper, or if a petition for extension of time is required for timely acceptance of the same, such a petition is made and the Office is authorized to charge such fees to Deposit Account No. 04-1679.

Respectfully submitted,

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